Synoptic Model to Rank Wetland Ecosystems For 404 Permitting

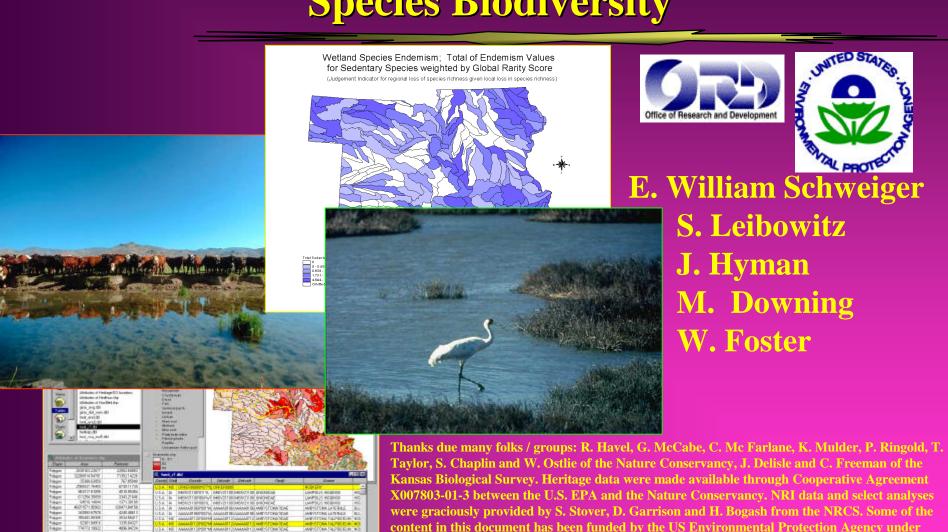


Brenda Groskinsky, U.S. EPA, Region 7





Synoptic Assessment of Wetland Function: a Planning Tool for Protection of Wetland Species Biodiversity



for publication.

contracts 68-C6-0005 to Dynamac Corporation Environmental Services and GS07T97BGD0003 to Affiliated Computer Services. This paper has been subjected to Agency review and approved



Wetland in Region 7

- National surveys indicate that a large proportion of historic wetland has been replaced by other land cover/use types
 - rate and proportional loss of wetland exceeds other habitat types
- 95% (IA), 87% (MO), 48% (KS), and 35% (NE) of pre-settlement wetland area lost (conservative estimates)





Rare Wetland Species in Region 7



- 1137 species listed (G1-G5) by Heritage programs in Region 7; 143 federally endangered, 162 federally threatened
- Over 55% of these species are wetland dependent
- 69 species globally imperiled
- Major flyway for wetland dependent waterfowl, including several rare species
- Center of mussel diversity





CWA 404 Permit Review

- Regulation of discharge into waters of US
 - includes wetlands
- COE/EPA review of permit applications
- Heavy load of reviews
- Current prioritization
 - BPJ, local conditions, socio-politico constraints
 - has been successful, but typically does not incorporate cumulative effects, landscape-scale processes and generally lacks rigor





Goals of Region 7 Synoptic Prioritization

- Reduce the Loss in Wetland Species Biodiversity to the Greatest Extent Possible
- Prioritize Protection Efforts (Section 404 Permit Review)
- Use a Defensible, Rigorous and Repeatable Framework
- Continue Development of Synoptic Framework





EPA Region 7 Wetland Biodiversity Protection

Prioritizing CWA 404 Wetland
Permit Review Effort Among SubBasins Using an Analytical
Methodology (Synoptic Ranking)





Synoptic Framework

- We need approaches for prioritizing because our ability to restore, protect or manage ecological resources is limited.
 - Prioritization assures we maximize ecological benefit gained from limited resources.
- Synoptic framework
 - approach that formalizes prioritization process
 - approach is explicit and repeatable
 - approach has assumptions





Synoptic Framework

should be used when...

- Quantitative, Scale-appropriate Information Not Available or Too Costly
 - data, opportunities for data collection, ecological knowledge (e.g., scale appropriate theory)
- Available Effort Limited
 - time, money, labor
- High Demand For Prioritization
- Cost of Wrong Answer Low
 - semi-qualitative



Synoptic Framework

Key Components

- Conceptual model of relationship between ecological endpoint and management effort
- Explicit (formal) prioritization criterion and statements of relationships
- Results expressed in usable format



Conceptual model

- Conceptual model of relevant ecological processes
- Helps guide prioritization
- Helps ensure inclusion of relevant ecological data





Prioritization

- Prioritization Criteria Used for Ranking:
 - 1) Projected marginal change in an ecological endpoint per unit restoration effort

or

- 2) Projected marginal change in an ecological endpoint avoided per unit protection effort
- Analogous to a benefit-cost ratio
 - benefit expressed in terms of an ecological endpoint, cost expressed in terms of management effort



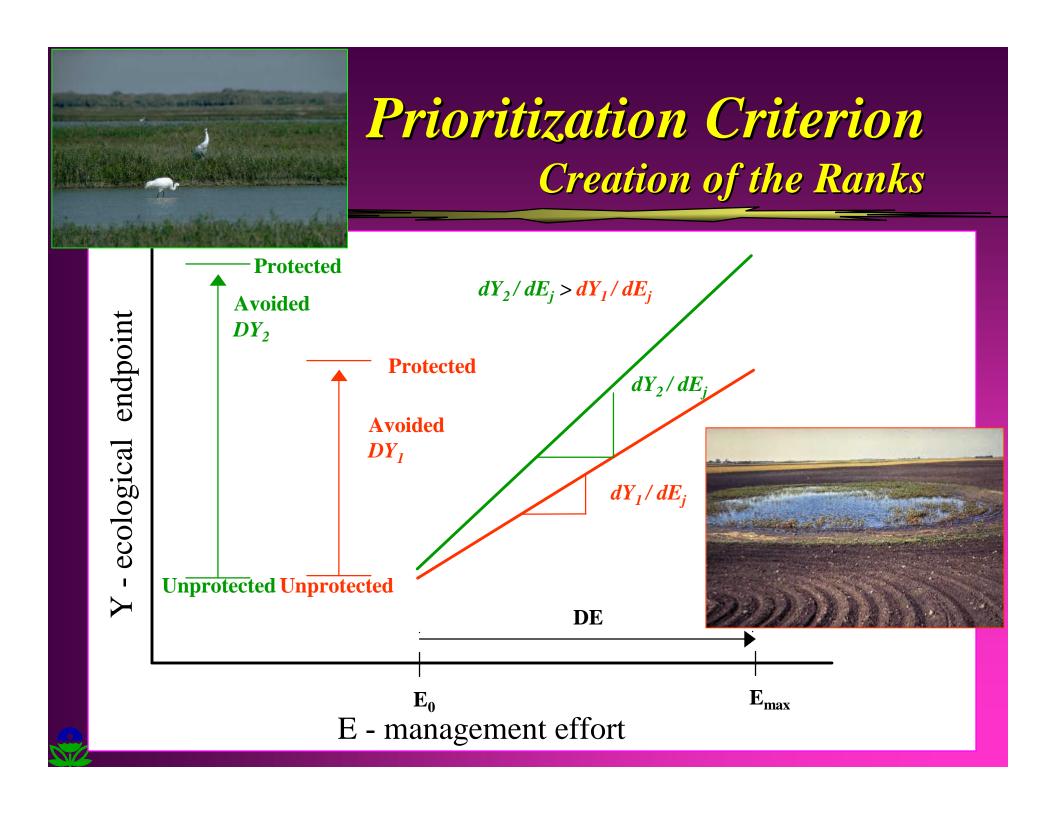


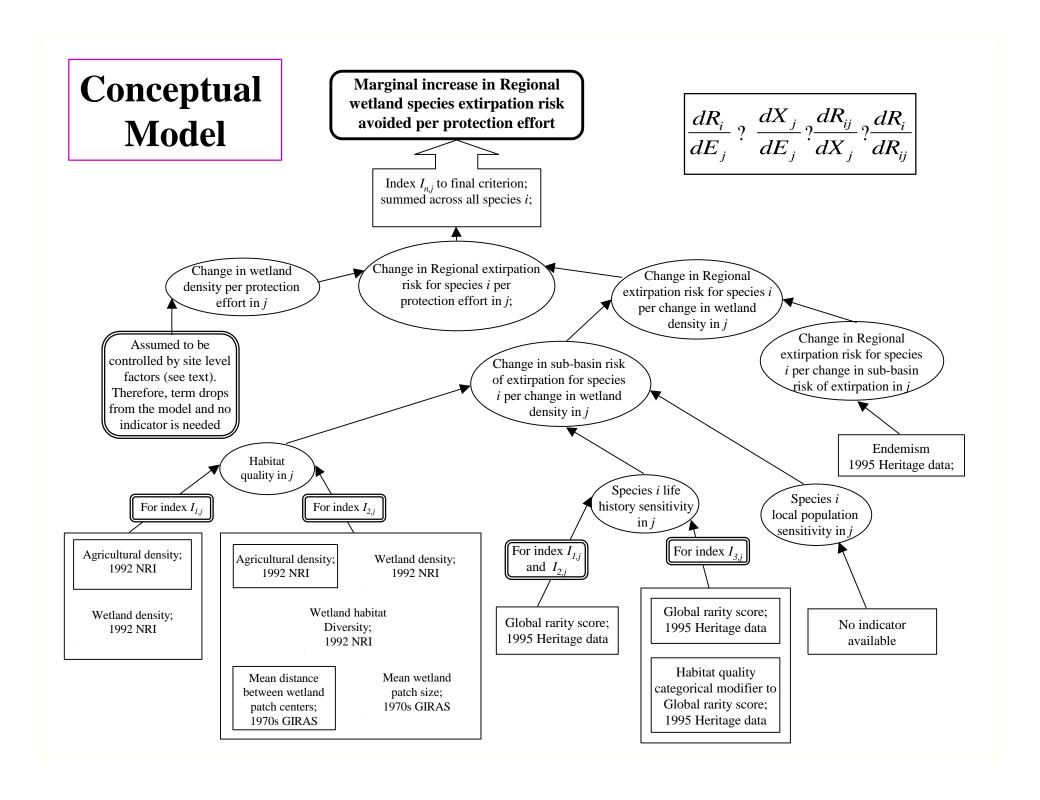
Prioritization Criterion: dR_i / dE_j

- Marginal increase in Regional wetland species extirpation risk (R_i) avoided per unit CWA wetland 404 review effort (E_i)
 - Criterion is "change in risk" not "total risk"
 - Applies only to 404 permits pertaining to wetlands (vs. general aquatic habitat)
- Estimate by species; sum to total score for j
- Linear benefit model:

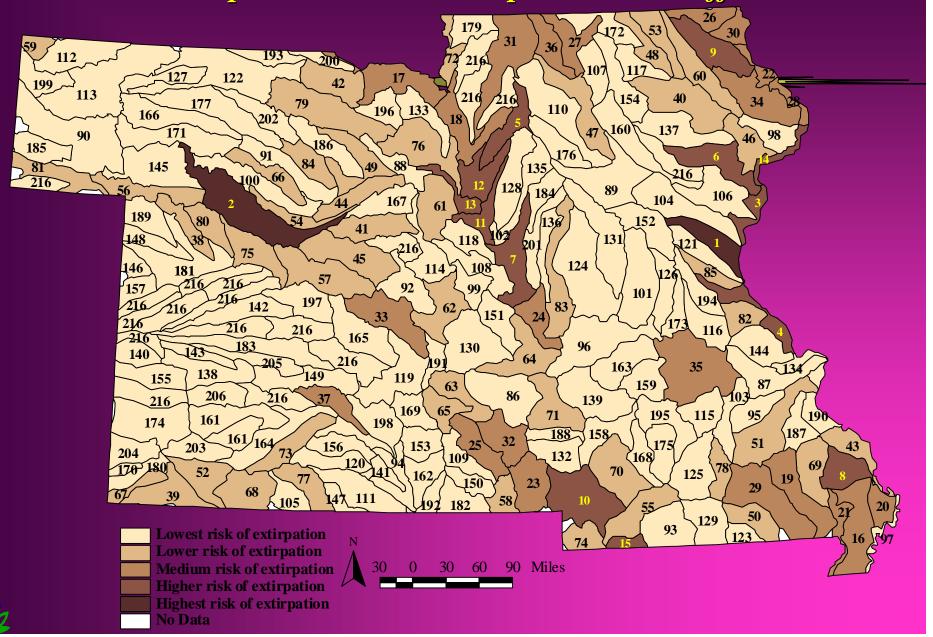
$$DR_{i_{DE_{j}}}$$
? DE_{j} ? $\frac{dR_{i}}{dE_{j}}$



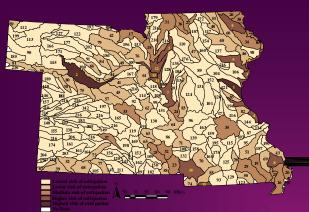




Ranked marginal increase in Regional wetland species extirpation risk avoided per unit wetland 404 permit review effort







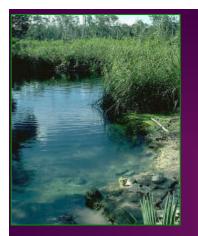
Patterns

- Sub-basins in the top two priority classes appear (qualitatively) to be concentrated along:
 - the Mississippi on the eastern Iowa and Missouri borders,
 - the Platte in central Nebraska,
 - the Missouri along the Nebraska/Iowa border,
 - the Neosho in southeast Kansas and southwest Missouri
 - the Ozark plateau / bootheel of southern Missouri.

• Reasons?

- high density of sensitive endemics
- intense agriculture
- high wetland density (?)
 - may not provide adequate refugia
 - species specific response to wetland type





Interpretation / Use

• Section 404 wetland permit review (E_j) within high priority sub-basins should receive highest priority for review to minimize marginal increase in Regional wetland species extirpation risk (R_i)





Comparison to historic Region 7 404 permit review effort

- Summarized historic (1988 1998) EPA R7 404 review effort
- Implicit expression of priorities
- Compared results with synoptic prioritization
- Positive, but weak match
 - Why?:
 - different goals, different population, multiple criteria (WQ, hydro)





Next steps

- Better spatial unit Level IV ecoregions?
- Smaller scale down to the patch?
- Lotic systems?
- Integrate wetland type/species specific responses
- Other prioritization criterion WQ?, flood reduction?
- Better (more recent, higher resolution) indicator data (MRLC, NWI, ecoregions, etc.)





Conclusions

- Management tool intended to assist in making decisions about resource allocation
- Enable resource managers to place wetland sitespecific decisions within a regional context and focus efforts on sub-basins where functional potential is highest
- Protection of wetlands in higher ranked units should, on average, avoid a larger increase in the risk of wetland species extirpation than protection in lower ranked units



End!



Brenda Groskinsky - US EPA R7 901 N. 5th St., Kansas City, KS 66101 (913) 551-7188

